BRICKFIELD BURCHETTE RITTS & STONE, PC

August 3, 2001

VIA E-MAIL & FEDERAL EXPRESS

Mr. Gary Curtis
D&R International
147 Commercial Street, NE
Salem, OR 97301

Re: Comments on Modification of Energy Star Window & Door Criteria to Satisfy Current Building Energy Efficiency Codes

Dear Gary:

Enclosed are our comments in response to the Department of Energy's request for participation and comment by interested parties in identifying options to address potential changes to the ENERGY STAR Windows program criteria in response to current model energy codes and recent state adoption of energy codes.

Our firm has reviewed and offered comments regarding the ENERGY STAR Windows program since its inception. We have also actively participated in the development of the 2000 International Energy Conservation Code (IECC), the current, nationally accepted model energy code, and many state-developed codes. Finally, we are a member of NFRC, where I serve on the Board, representing the building industry.

In light of this experience, we have prepared the enclosed comments and a recommendation to the Department for potential changes to ENERGY STAR criteria. Our recommendation is based upon criteria for windows (including doors and skylights) that would meet or exceed the IECC and other state developed codes, while working within the existing ENERGY STAR windows Northern, Central and Southern zones framework.

We appreciate the opportunity to provide these comments, and we look forward to working with you and the Department during this review process.

Please contact us if you have any questions.

Sincerely,

Garrett A. Stone

GAS:pgg

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COMMENTS ON MODIFICATION OF ENERGY STAR WINDOW & DOOR CRITERIA TO SATISFY CURRENT BUILDING ENERGY EFFICIENCY CODES

August 3, 2001

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INTRODUCTION AND EXECUTIVE SUMMARY

In the notice to ENERGY STAR™ Windows stakeholders last month, the United States Department of Energy has identified the fact that recent code changes have resulted in fenestration code requirements that equal or exceed the ENERGY STAR Windows criteria and has requested interested parties to submit comments on how the ENERGY STAR Windows program criteria might be modified in order to meet or exceed these requirements.

In response to this request, we offer the following comments regarding potential changes to the ENERGY STAR windows criteria (including glazed doors and skylights) and the possible adoption of new criteria for opaque and mostly-opaque doors. Given our experience with building energy efficiency codes and voluntary energy efficiency programs, we have evaluated the existing specifications in light of the evolution of building energy efficiency codes over the past few years and identify below what we believe is the optimal solution to modifying the program to satisfy current code requirements. The approach outlined in these comments is limited to satisfying current code requirements based on the express limitations set forth in the Department's notice.

We have concluded that certain fundamental principles have historically been incorporated into the ENERGY STAR platform and should remain the guideposts for this round of modifications to the criteria. Specifically, the ENERGY STAR Windows program should strive to:

- Be as simple for the consumer as possible and avoid any complication that could cause marketplace confusion and undercut the overall message;

- Meet code requirements at a minimum, but ideally exceed code requirements so as to move the marketplace above the minimum standard – the code standard should be based on the national model code recently endorsed by the Department (the 2000 International Energy Conservation Code – the widespread state adoption of this code now occurring underscores the use of this standard), although some consideration should also be given to the requirements of state-specific codes like California;

- Make sufficient changes in each round of improvements to the criteria, such as to avoid constant new modifications, but limit unnecessary modifications where possible to maintain continuity;

- Do not exceed realistic products available in the marketplace (e.g., do not require triple glazing or darkly-tinted products); and

- Incorporate and promote relevant NFRC ratings.

We have concluded that the best approach to meet all of these objectives would include: (1) a change to the criteria of the Central Zone to incorporate a code-compliant SHGC; (2) reasonable revisions to the ENERGY STAR map to align with code-based climate zones; and (3) adoption of an air leakage requirement.

At a minimum, the criteria must be improved to meet code everywhere. We believe that this can best be accomplished by utilizing the replacement fenestration criteria of the IECC, which provide a somewhat simplified, convenient set of minimum criteria by climate zone (these criteria are also the most stringent prescriptive code criteria for fenestration due to the simplified climate zones). The IECC specifications that are more stringent than ENERGY STAR in certain climate zones are a 0.50 U-factor above 2,000 Heating Degree Days (HDD), a 0.40 SHGC up to 3,500 HDD, and a 0.35 U-factor down to 6,000 HDD (these criteria effectively create 5 zones under the IECC).[1] The code also requires a 0.3 cfm/ft^2 maximum air leakage everywhere.[2]

In order to avoid increasing the number of zones (which would increase confusion and complexity), reasonable revisions to the ENERGY STAR map, along with a change to the criteria of the Central Zone and adoption of the air leakage requirement could effectively achieve code compliance. Specifically, we would recommend under this option that:

(1) The Southern zone be limited to areas less than 2,000 HDD, the Central zone extend from 2,000 HDD to less than 6,000 HDD and the Northern zone apply to 6,000 HDD and above (with this change, the ENERGY STAR U-factor will equal the IECC U-factor for the Southern and Northern zones and equal or exceed the IECC U-factor for the Central zone);

(2) Maximum SHGC be set at 0.4 for the Central zone (consistent with the IECC requirement); and

(3) Maximum air leakage for all zones be set at 0.3.

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[1] *See* 2000 IECC Section 502.2.5: Prescriptive Path for Additions and Window Replacements, and Table 502.2.5: Prescriptive Envelope Criteria Additions to and Replacement Windows for Existing Type A-1 Residential Buildings. *See also* 2000 IECC Sections 502.1.5 & 502.2.4.15: Fenestration Solar Heat Gain Coefficient.

[2] *See* 2000 IECC Section 502.1.4: Air Leakage and Table 502.1.4.1: Allowable Air Infiltration Rates.

We recommend that the windows criteria also consistently be applied to all doors (including opaque doors) and skylights to the degree possible. Limiting differences in the criteria for each of these products will reduce confusion and enhance simplicity. While we understand the argument that some opaque doors can achieve better U-factors and SHGCs than glazed doors under certain circumstances, we think any benefits from a higher standard for such doors are far outweighed by the increased complexity and potential confusion (after all, opaque doors are a very small percentage of the building envelope). At a minimum, all doors with some glazed area should be required to meet the windows criteria.

The only difference in criteria among fenestration products that we believe can be justified at this time is a more lenient skylight U-factor criteria. The IECC specifically requires that skylights have a U-factor of 0.50 or better for climates with HDD greater than or equal to 2,000.[3] This standard, or the existing ENERGY STAR U-factor standards for skylights, would seem most appropriate. Using a 0.35 or 0.40 U-factor standard for such products would be unreasonable.

Finally, we believe that is important to recognize that there are other potential criteria, although not code-required and therefore outside the scope of this round of revisions, that the Department should consider for future revisions of the ENERGY STAR criteria. Specifically, NFRC is in the process of rolling out new energy-related ratings, such as condensation and fading resistance, that should ultimately be considered for incorporation into ENERGY STAR. NFRC's existing VT rating is another possible consideration. Durability (e.g., the permanence of the energy efficiency features) should also be incorporated. Since there is no such durability rating presently available, a strong warranty requirement could be utilized as a proxy.

In sum, with limited modifications – e.g., the map, Central climate zone SHGC, and air leakage – the ENERGY STAR Windows program can be brought into consistency with current building energy efficiency codes. We recommend that the Department make these essential modifications.

INDUSTRY AND CODE IMPROVEMENTS SINCE THE ENERGY STAR WINDOWS PROGRAM WAS INITIATED

Since the ENERGY STAR Windows program was implemented in early 1998, considerable strides have been made in the entire fenestration arena. For example, over the past several years, the NFRC program has become widely implemented by window manufacturers and has achieved general acceptance by industry stakeholders throughout the country. When NFRC first published its Certified Product Directory in

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[3] *See* 2000 IECC Section 502.2.5: Prescriptive Path for Additions and Window Replacements.

> "**Exception:** Replacement skylights shall have a maximum U-factor of 0.50 when installed in any location above 1,999 HDD."

1993, less than 4,000 products were rated for U-factor and none were rated for SHGC. The NFRC CPD now reports that over 82,000 products are rated for U-factor and over 60,000 are rated for SHGC. ENERGY STAR and improved codes have both contributed hugely to this progress by essentially requiring NFRC ratings.

Moreover, the NFRC-rated product statistics show substantial numbers of products at the most stringent levels of performance. The following graphic diagrams the breakdown of NFRC ratings in relation to existing ENERGY STAR window requirements.

NFRC Product Distribution

Energy Star Zone	U-factor	# of Products	% of Total	SHGC	# of Products	% of Total
	All U-factors	82,678	--	All SHGCs	60,050	--
Northern	0.35 and below	28,578	35%			
Central	0.40 and below	44,918	54%	0.55 and below	53,878	90%
Southern	0.75 and below	80,078	97%	0.40 and below	29,580	49%

Source: NFRC Certified Products Directory, 9th Ed. (available online at www.nfrc.org).

Again this level of availability of very efficient products is a function of both the success of the ENERGY STAR window program and improved codes. Over the past several years the national model code, the IECC, as well as state-specific codes in states like California and Florida, has significantly improved the code requirements for fenestration products. Indeed, as the Department has noted, the stringency of the performance and prescriptive requirements for fenestration in the IECC has brought codes to the level of, or even exceeding, ENERGY STAR. The IECC has also made it easier for builders to determine which windows will comply with the code in various parts of the country.

A brief summary of fenestration code improvements helps to place the IECC's present requirements into perspective. The progression started in the 1995 edition of the Model Energy Code, the immediate predecessor to the IECC. For the first time in the 1995 version, the MEC required all fenestration products to be rated, certified and labeled with NFRC U-factors, or by a limited default table. In 1998, with the first edition of the IECC, the national model code took another bold step by adding requirements to reduce solar heat gain. Specifically, the IECC requires all fenestration (new,

replacement, and additions) installed in locations with heating degree-days less than 3,500 to have SHGCs of 0.40 and below.[4] The 1998 version also added prescriptive tables to allow users to readily determine which windows will meet the code in various climatic regions, and it added prescriptive U-factor and SHGC requirements for fenestration in additions and replacements. The 2000 IECC retains all of these fenestration requirements and added a new simplified prescriptive option to ease compliance. (This same simplified prescriptive option (as well as other fenestration requirements) is found in the 2000 International Residential Code – Chapter 11.) Finally, the IECC and IRC contain a prescriptive requirement for air leakage – a maximum 0.3.[5]

With these new fenestration provisions, the IECC now contains prescriptive window requirements that are in some areas of the country more stringent than those under the ENERGY STAR Windows program. This creates an obvious anomaly in that a federally sponsored market transformation program with a goal to promote energy efficient windows actually promotes some windows that would not meet minimum requirements under the national model energy code. This is truly an anomaly because, as it is often described, the IECC, when adopted in a state, specifies the absolute worst window allowed by law. For ENERGY STAR to be less stringent than the code would certainly send the wrong message.

The 2000 IECC is the current, nationally accepted model energy code standard and, as a result, is the appropriate source of code requirements on which to base a national energy efficiency program such as ENERGY STAR. This is evidenced by the Department of Energy's own certification of the 2000 IECC in early 2001 under the Energy Policy Act.[6] As a result, States are now legally required to consider updating to the 2000 IECC, as many have already done. It would be inconceivable that the Department would rely on any source in lieu of the 2000 IECC. In fact, in its determination, the Department specifically called out two fenestration-related improvements to the IECC, the SHGC requirement and the replacement windows requirement, as the only major improvements over the MEC.[7]

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4 *See* n.1 above.

5 *See* n.2 above.

6 BUILDING ENERGY STANDARDS PROGRAM: DETERMINATIONS REGARDING ENERGY EFFICIENCY IMPROVEMENTS IN THE 1998 AND THE 2000 INTERNATIONAL ENERGY CONSERVATION CODES FOR RESIDENTIAL BUILDINGS, 66 Fed. Reg. 1964 (Jan. 10, 2001). With this Determination, the Energy Policy Act of 1992 now requires each State, not later than January 10, 2003, to certify to the Secretary of Energy that it has reviewed the provisions of the 2000 International Energy Conservation Code ("IECC") and make a determination as to whether it is appropriate to adopt the IECC or revise its current building code provisions to meet or exceed the IECC.

7 *See* DOE DETERMINATION, n.6 above, at pp. 1965, 1968.

Texas has received considerable attention lately because it took a monumental step by adopting the International Residential Code for new construction, additions and replacements. Until this year, Texas had no energy code, or any building code for that matter. As mentioned above, the IRC's energy chapter (Ch. 11) contains the same fenestration requirements as the IECC for homes with up to 15% glazing and for replacement fenestration. For homes with greater than 15% glazing, the IRC incorporates the IECC by reference, including its various prescriptive, component performance and systems analysis approaches.[8]

Adoption of the IRC by the state of Texas breaks down any barriers that may have existed in the southern United States to IECC adoption. Prior to the recent surge of IECC adoption in southern states, many had predicted that the IECC would face an uphill battle in southern states. Suffice it to say, this "uphill battle" in warm-weather states has been far less than expected: California has created their own code that contains fenestration requirements similar in stringency to the IECC U-factor and SHGC requirements; South Carolina has adopted the IECC without substantive amendment; as just mentioned, Texas has adopted the IRC with direct reference to the IECC for homes above 15% glazing; Arizona has adopted the IECC voluntarily; Florida has adopted requirements similar to the IECC; and Georgia is currently reviewing the IECC for potential adoption.[9]

States farther north are also moving forward with IECC adoption: Maryland has adopted the IECC without substantive amendment, and New York and Pennsylvania have adopted and are in the final stages of implementing the IECC. Other states and localities can be expected to adopt the 2000 IECC over the next few years. As evidenced by the rapid adoption of the IECC throughout the U.S., it is safe to say that the IECC is the proper baseline from which to compare existing ENERGY STAR. Furthermore, through our review of other state-developed codes, none appear to have fenestration requirements more stringent than the IECC standards for replacement windows. For these reasons, the IECC provides an excellent baseline from which to measure the existing ENERGY STAR program.

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[8] *See* 2000 IRC Section N1102.1 Residential buildings, Type A-1. "Compliance shall be demonstrated by either:

1. Meeting the requirements of this chapter for buildings with a glazing area that does not exceed 15 percent of the gross area of exterior walls; or
2. Meeting the requirements of the *International Energy Conservation Code* for residential buildings, Type A-1."

[9] North Carolina has adopted the IECC. However, we have not included North Carolina in this list because the state, during its statewide code development process, deleted the IECC's 0.40 maximum SHGC requirement, which would have applied in roughly 2/3 of the state. However, we expect North Carolina to adopt the provision in the future.

EXISTING ENERGY STAR IS LESS STRINGENT THAN THE IECC

For simplicity, the easiest comparison to the IECC can be made by looking at the IECC additions and replacement window prescriptive requirements (in Chapter 5), which are diagrammed in the color-coded map in **Attachment 1**. The existing IECC maximum 0.4 SHGC requirement (for new homes, in additions, and as replacements) is mapped out in **Attachment 2**.

A prime case in point of areas where ENERGY STAR falls behind the IECC is in many southern parts of the country. As an example, in the Dallas metropolitan area, a window carrying the ENERGY STAR label may not meet the IECC/IRC recently adopted in the state. Dallas falls into the Southern ENERGY STAR zone (0.75 U-factor and 0.4 SHGC). As indicated in **Attachment 1**, under the IECC/IRC, windows used in additions and replacements must have a U-factor 0.50 or below and a maximum 0.4 SHGC (the same 0.4 SHGC requirement as ENERGY STAR). For new homes in Dallas with a maximum glazing area of 15%, the IECC/IRC U-factor requirement is slightly higher at 0.65. Regardless, it is quite evident that an ENERGY STAR labeled window in Dallas would not necessarily meet the Texas energy code. In addition, the current ENERGY STAR criteria would be inconsistent with existing utility programs in Texas. Under a Texas Public Utility Commission approved market transformation program, the Texas Window Initiative currently educates and encourages consumers to purchase windows that have below a 0.40 U-factor and 0.40 SHGC to realize all potential cooling savings and heating savings and to provide added insulation benefits of low U-factor windows. While the ENERGY STAR U-factor fails in Texas, as another example, the ENERGY STAR SHGC fails in South Carolina, where the IECC (which has been adopted in South Carolina) requires a 0.4 SHGC in parts of the state where ENERGY STAR (Central climate zone) would only require a 0.55 SHGC.

ENERGY STAR also falls short in much of California. Current ENERGY STAR requires a maximum 0.4 SHGC in southern California only. Under California's new Title 24 energy efficiency standards, all windows (in all orientations) installed in areas with notable air conditioning loads must meet a maximum 0.4 SHGC requirement, which covers 11 of the state's 16 climate zones; only northern California, some coastal areas, and the mountain regions are exempt.[10] The IECC's 0.4 SHGC requirement would apply in generally the same areas.

Air leakage is another area where ENERGY STAR falls short of the IECC. The IECC, and many state-developed codes, including California, contain maximum air leakage requirements for fenestration (windows, skylights, swinging and sliding doors). ENERGY STAR has no requirement for air leakage. The IECC requires all windows and

[10] *See* California AB 970 Energy Efficiency Standards for Residential and Nonresidential Buildings, Tables 1-Z1 through 1-Z16, "Alternative Component Packages" for Climate Zones 1 – 16.

sliding doors to have air leakage rates below 0.3 cfm/ft^2 and swinging doors to be below 0.5 cfm/ft^2 when tested in accordance with ASTM E 283.[11]

NECESSARY MODIFICATIONS FOR ENERGY STAR CRITERIA TO EQUAL CODE

Within the existing ENERGY STAR framework, various adjustments can be made to bring ENERGY STAR up to the code. In a nutshell, ENERGY STAR's existing maximum 0.75 U-factor requirement extends too far north, and its existing maximum 0.4 SHGC requirement does not extend far enough north. Likewise, the 0.35 northern U-factor does not extend far enough south. In some zones, or some parts of existing zones, current ENERGY STAR need not change significantly to keep pace with the IECC. **Attachment 3** sets out a revised map and U-factor and SHGC criteria consistent with the IECC. We recommend adoption of these criteria as discussed below.

A. ENERGY STAR Northern

The existing 0.35 maximum U-factor requirement continues to represent the best available technology to provide maximum cost-effective insulating benefit. Moreover, the code requires a maximum 0.35 U-factor. 35% of the current products rated under NFRC have U-factors of 0.35 and below. This indicates that the technology is readily available. Maintaining the 0.35 maximum U-factor would continue to push the market to this level of efficiency. Lowering this requirement further would push manufacturers into triple glazing, which never has been shown to be cost-effective, nor would it be required by code – a 0.35 U-factor is the lowest level required by the IECC.

If the goal is to meet the code, we recommend leaving the existing Northern zone requirements as they are now. However, to keep pace with the IECC, the area falling under the Northern zone must be adjusted to some extent. To equal the IECC's U-factor requirements, the Northern line should be readjusted to require the 0.35 U-factor in all of Nebraska and Iowa, in the northern parts of Illinois, Indiana and Ohio, in a much larger portion of Pennsylvania, and in parts of West Virginia. (See **Attachment 3**). This approach would apply the 0.35 U-factor to areas with HDD equal to or greater than 6,000 HDD, consistent with the IECC requirements.

B. ENERGY STAR Central

The most significant change to existing ENERGY STAR are the changes needed in the Central zone. The required Central zone changes have the potential to generate significant heating energy and cooling peak and energy savings previously untouched by ENERGY STAR. Specifically, the Central zone's southern boundary should be

[11] *See* n.2 above.

extended down to 2,000 HDD and its SHGC requirement should be reduced to 0.4 SHGC.

If these limited changes are not made, ENERGY STAR would be required to establish a fourth, South Central zone to be consistent with code requirements, with at least a 0.50 U-factor and 0.40 SHGC maximum, extending from 2,000 HDD to 3,500 HDD. Such a change would unnecessarily complicate ENERGY STAR and confuse customers who have grown accustomed to the existing three zone approach.

Adoption of the 0.4 SHGC for the Central zone is warranted because in many of these areas, there are significant cooling requirements during warm-weather months, which necessitate high summer peak load capacity for utilities in this region. Many areas of California are prime examples of where a maximum 0.4 SHGC is warranted and already required by Title 24 (and would also be required under the IECC). Peak demand reduction is also critical, particularly given the recent crises in California and other states involving available summer peak electric capacity. Shortages in summer peak electric capacity in California were the key drivers behind AB 970, which is the legislation that forced a review of California's energy efficiency standards. Expanding the 0.4 SHGC requirement across much of the state provided an easy solution because of the cost-effective summer peak electric demand savings associated with it.

Furthermore, such a change would not involve significant cost or technology advancement. Windows sold in the Central zone already require a low-e coating to meet the 0.40 U-factor requirement. Revising the requirements to require a low solar gain low-e coating in the Central zone would be easily achievable through available technology – almost half the windows rated through NFRC have SHGCs of 0.4 and below. This technology shift would impose the same or very similar cost when compared to any low-e coating currently being used to meet the 0.40 U-factor requirement. A maximum 0.4 SHGC would provide significant cooling peak demand and energy savings in these regions, while at the same time deliver the heating savings already required under ENERGY STAR U-factor requirements for the Central zone.

When comparing IECC to ENERGY STAR, the IECC requires the 0.4 maximum SHGC in many more climate zones. Areas that are, for the most part, currently missed by ENERGY STAR and captured by the IECC 0.4 SHGC requirement include, Oklahoma, Arkansas, South Carolina, and most of North Carolina. The IECC's 0.4 SHGC also extends to much larger portions of California, Mississippi, Alabama and Georgia. (See **Attachment 2**.)

In the southern parts of the existing ENERGY STAR Central zone, there is also a big difference in U-factor requirements when compared to the IECC. Under the IECC, as indicated in **Attachment 1**, U-factors up to 0.75 are permitted only in Florida, in the southernmost parts of California, in southwest Arizona, and in the southern ¼ of Texas, Louisiana, Mississippi, Alabama and Georgia. Current ENERGY STAR requirements allow the 0.75 U-factor requirement to extend further to almost all of Texas (except the panhandle), the southern edge of New Mexico, all of Louisiana, and half of Mississippi, Alabama and Georgia. As a result, we recommend lowering the Southern line to

require a 0.40 maximum U-factor in all but the southernmost portions of the U.S. Thus, cities like Charlotte, Dallas, Las Vegas, Memphis, and Washington, DC, which all could greatly benefit from both heating and cooling savings attributable to low U-factors and SHGCs, would be appropriately positioned under such new ENERGY STAR criteria. (See **Attachment 3**).

C. ENERGY STAR Southern

Similar to the Northern zone, there are some areas of the country where existing ENERGY STAR criteria are still compatible with the IECC. In the Southern zone, ENERGY STAR's existing 0.75 U-factor requirement is equivalent to the IECC in some areas, but not all.

Unfortunately, promoting 0.75 U-factor fenestration does nothing to further energy efficient windows – 97% of the product lines currently rated through NFRC have U-factors of 0.75 or better. However, it is understandable that the program has focused solely on solar heat gain in the south. To remain only equivalent to the IECC (if that is to be the goal), we do not oppose leaving the existing Southern zone 0.75 U-factor and 0.4 SHGC requirements as is. However, the current shape of the Southern zone must be minimized to match the stringency of the IECC's U-factor requirements. As noted above, to match IECC, the Southern zone must be limited to a much smaller area of the country, specifically areas below 2,000 HDD. The current ENERGY STAR boundary for the Southern zone extends to locations with HDD well above 2,000.

Under the IECC, as indicated in **Attachment 1**, U-factors up to 0.75 are permitted only in Florida, in the southernmost parts of California, in southwest Arizona, and in the southern ¼ of Texas, Louisiana, Mississippi, Alabama and Georgia. To match the IECC, we propose that the Southern line be lowered as indicated in **Attachment 3**, which is also consistent with our recommendations above for the Central zone and with the IECC.

D. Fenestration Air Leakage Requirements in the IECC

As discussed above, ENERGY STAR has no maximum air leakage requirements for fenestration. Ironically, even predecessors to the IECC, which for the most part ignored energy efficiency requirements for fenestration, contained maximum air leakage rates. ENERGY STAR's failure to prescribe air leakage rates leaves out an integral component of the complete energy efficiency package, and theoretically, allows efficiency gains achieved through high performance window components to be offset by losses through fenestration product air leakage. Presumably, ENERGY STAR has not included air leakage because of a lack of an NFRC certified-rating. Fortunately, NFRC recently approved its air leakage rating for certification and is ready to move forward to provide this rating. We recommend that DOE phase in a requirement for this rating, set no higher than the current IECC standard – 0.3 cfm/ft^2. The requirement could be

phased in either by accepting alternative air leakage certifications for a phase-in period or simply postponing the effective date for this new criteria.

E. Summary of Proposals for ENERGY STAR to Equal the IECC

To catch up to the IECC, ENERGY STAR could revise its standards to have the following breakdown (A map of these proposed ENERGY STAR requirements to match the IECC is in **Attachment 3**):

ENERGY STAR Zone	HDD	U-factor	SHGC	Air Leakage
Northern	6,000 and above	0.35	Any	0.3 cfm/ft^2
Central	2,000 – 5,999	0.40	0.40	0.3 cfm/ft^2
Southern	1,999 and below	0.75	0.40	0.3 cfm/ft^2

ENERGY STAR DOORS AND SKYLIGHTS

There has been considerable discussion regarding new ENERGY STAR requirements for doors. We believe that the criteria we have set forth above are entirely appropriate and should be applied to windows **and** doors (and skylights, with the exception of U-factor). This approach would be consistent with the IECC. The IECC sets fenestration U-factor, SHGC and Air Leakage requirements for all doors in new homes, additions and replacements.[12] Under the IECC, "fenestration" is defined as:

> **FENESTRATION.** **Skylights**, roof windows, vertical windows (whether fixed or moveable), **opaque doors**, **glazed doors**, glass block, and **combination opaque/glazed doors**.

Likewise, the IECC requirements for additions and replacement fenestration also include all doors: "The U-factor of each individual **fenestration** product (windows, doors and skylights) shall be used to calculate an area-weighted average fenestration product U-factor . . . which shall not exceed the applicable listed values in Table 502.2.5 . . . ."

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[12] The IECC contains limited U-factor exceptions for skylights in northern climate zones – the maximum U-factor for skylights is 0.5. *See also* n.3 above.

and "**Fenestration** products used in additions and as replacement windows in accordance with this section shall also meet the [SHGC] requirements of Section 502.1.5 in locations with HDD less than 3,500." (See **Attachment 1** for the IECC's replacement fenestration U-factor and SHGC requirements.)

Thus, the best, most consistent, and most appropriate, criteria for ENERGY STAR doors would be to apply the same requirements as ENERGY STAR windows. This would be in line with the IECC requirements for doors, and it would provide a simple consumer recommendation across energy efficient fenestration product lines. In any event, we recommend that all doors with any glazing comply with the same window criteria.

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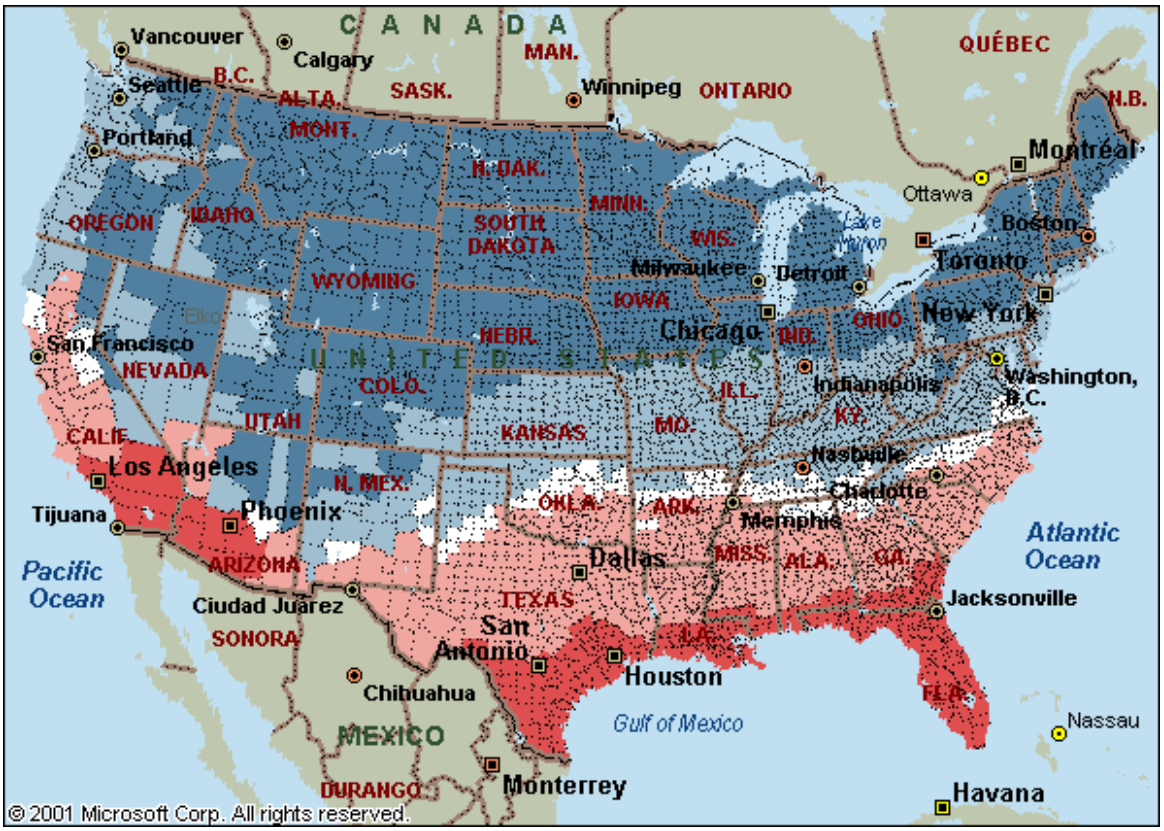
Attachment 1

IECC Replacement Window Climate Zones



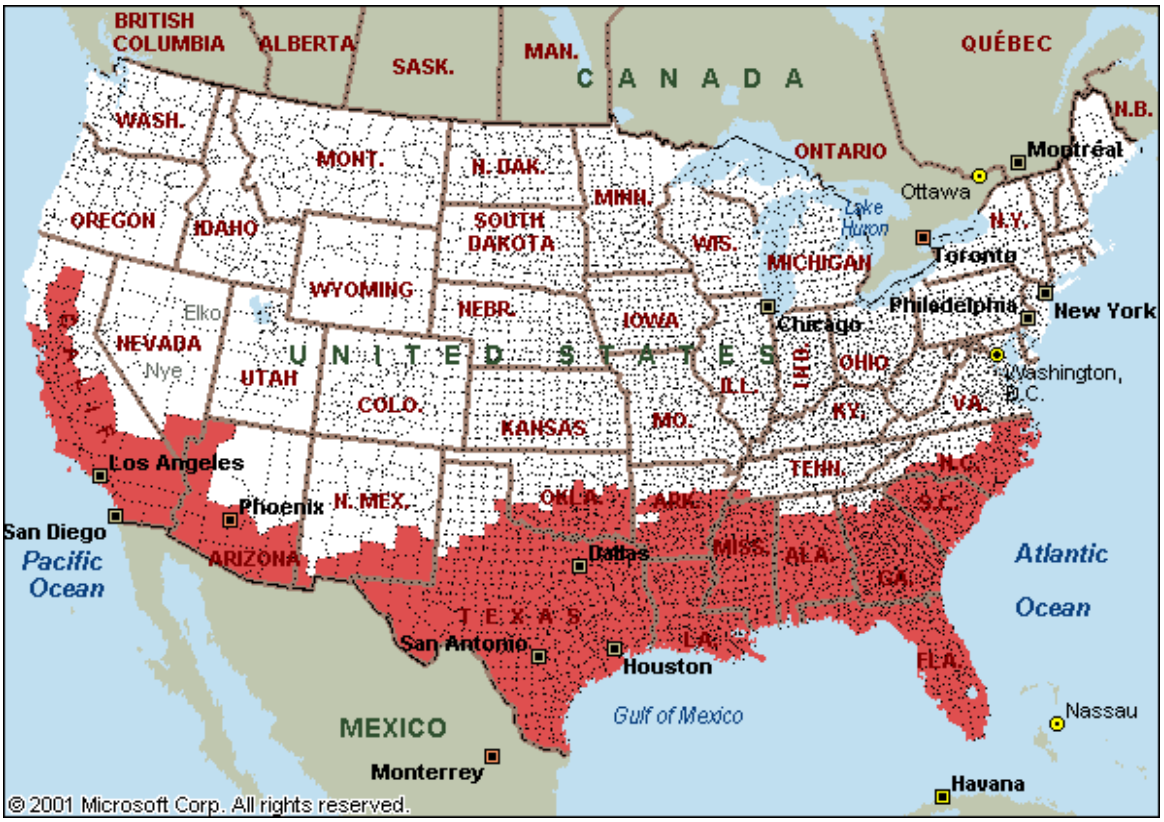
Prescriptive Requirements by Climate Zone

■	0 – 1,999 HDD	0.40 SHGC	0.75 U-factor
■	2,000 – 3,499 HDD	0.40 SHGC	0.50 U-factor
□	3,500 – 3,999 HDD		0.50 U-factor
■	4,000 – 5,999 HDD		0.40 U-factor
■	6,000 and above HDD		0.35 U-factor

Source: 2000 IECC Section 502.2.5: Prescriptive Path for Additions and Window Replacements, and Table 502.2.5: Prescriptive Envelope Criteria Additions to and Replacement Windows for Existing Type A-1 Residential Buildings. *See also* 2000 IECC Sections 502.1.5 & 502.2.4.15: Fenestration Solar Heat Gain Coefficient.

Attachment 2

IECC Maximum Window SHGC Climate Zones



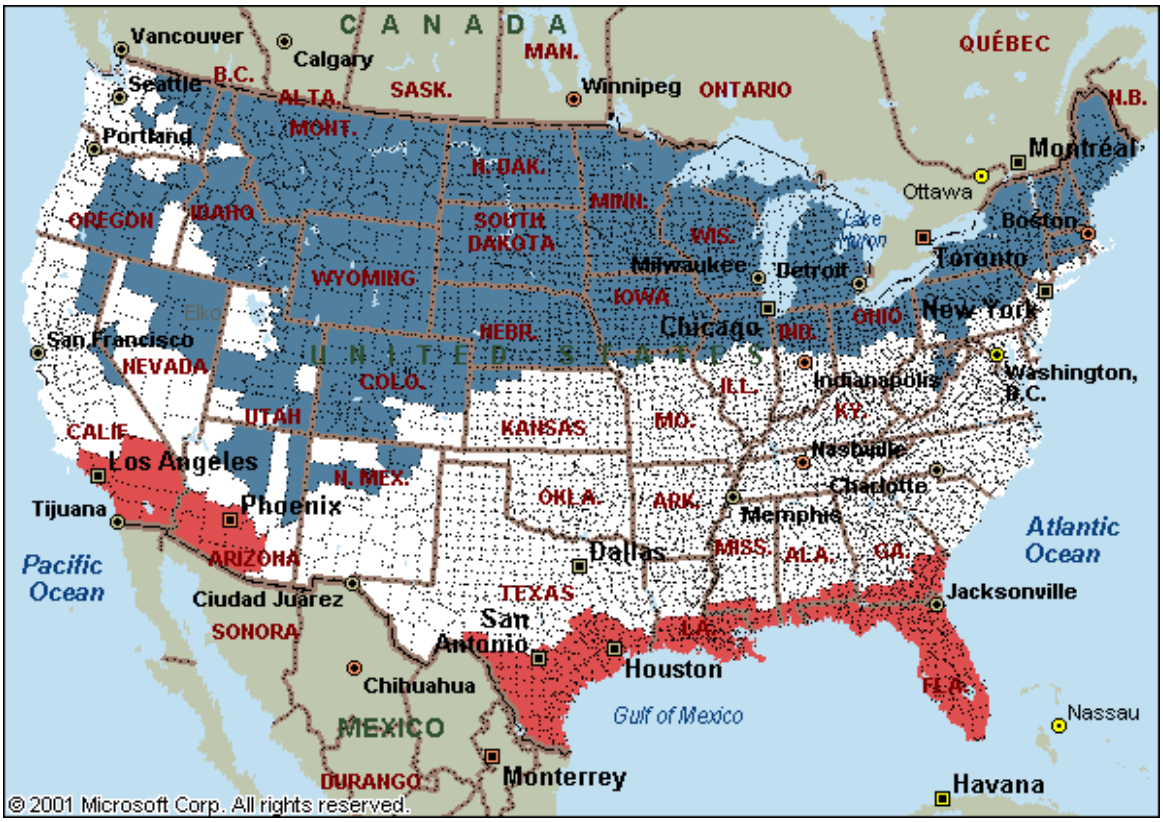
Prescriptive SHGC Requirements by Climate Zone

■	0 – 3,499 HDD	0.40 SHGC and below
□	3,500 and above HDD	No SHGC requirement

Source: 2000 IECC Sections 502.1.5 & 502.2.4.15: Fenestration Solar Heat Gain Coefficient, Section 502.2.5: Prescriptive Path for Additions and Window Replacements, and Section 602.2: Maximum Solar Heat Gain Coefficient for Fenestration Products.

Attachment 3

Recommended ENERGY STAR™ Window Climate Zones Consistent with IECC Window Requirements



Recommended ENERGY STAR™ Requirements by Climate Zone

■	0 – 1,999 HDD	0.40 SHGC	0.75 U-factor
□	2,000 – 5,999 HDD	0.40 SHGC	0.4 U-factor
■	6,000 and above HDD		0.35 U-factor